

# Exhibit 4

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**UNITED STATES DISTRICT COURT  
NORTHERN DISTRICT OF CALIFORNIA**

RED HAT, INC.,

Plaintiff,

v.

VIRTAMOVE, CORP.,

Defendant.

CASE NO. 3:24-CV-04740

COMPLAINT

DEMAND FOR JURY TRIAL

## NATURE OF THE ACTION

1           1. This is an action for declaratory relief arising under the patent laws of the United States.

2           2. Red Hat, Inc. (“Red Hat”) brings the instant action because Defendant VirtaMove, Corp.  
3 (“VirtaMove”) has commenced an aggressive litigation campaign against products relating to open source  
4 containerization and container orchestration technology. More specifically, VirtaMove has filed lawsuits  
5 against International Business Machines Corp. (“IBM”), Hewlett Packard Enterprise (“HPE”), Google,  
6 and Amazon.com Services LLC (“Amazon”), alleging that they infringe United States Patent Nos.  
7 7,519,814 (the “’814 patent”) and 7,784,058 (the “’058 patent”) (collectively, the “Asserted Patents”). A  
8 true and correct copy of the operative complaints against IBM, HPE, Google, and Amazon are attached  
9 as Exs. A-D.  
10

11           3. In these lawsuits, VirtaMove accused IBM, HPE, Amazon, and Google for use of their cloud  
12 and server computing products that offer containerization and container orchestration technology—  
13 including IBM’s Cloud Kubernetes Service, HPE Ezmeral Runtime Enterprise, Google’s Migration to  
14 Container, and Amazon Elastic Container Service (“ECS”) (collectively, the “Texas Cases Accused  
15 Products”). In its infringement contentions against IBM, HPE, and Google, VirtaMove identified entirely  
16 third-party, open source software—namely, Docker containers and the Kubernetes platform—as its basis  
17 for concluding that the Texas Cases’ Accused Products infringe. VirtaMove did not accuse or identify  
18 OpenShift, Red Hat’s containerization and container orchestration product, of infringing.

19           4. However, Red Hat’s OpenShift uses the same third-party Docker container and Kubernetes  
20 technology in its containerization and container orchestration operation. Because VirtaMove effectively  
21 concedes that mere use of Docker container and Kubernetes technology to implement containerization  
22 and container orchestration is sufficient to infringe its ’814 and ’058 patents, there is a cloud over Red  
23 Hat’s products; a threat to Red Hat’s business, its relationships with its customers and partners, and its  
24 sales of OpenShift; and a justiciable controversy between Red Hat and VirtaMove.

25           5. Therefore, Red Hat requests relief as follows: a declaratory judgment that Red Hat’s products  
26 do not infringe the Asserted Patents because they do not meet each and every limitation of any asserted  
27 claim.  
28

## THE PARTIES

6. Plaintiff Red Hat is a corporation organized and existing under the laws of the state of Delaware, with its principal place of business at 100 East Davie Street, Raleigh, NC 27601. Red Hat is a well-known software company that provides open source software products, including its OpenShift product, to enterprise customers. Red Hat is a subsidiary company of IBM after being acquired by IBM in 2019 but continues to operate as a separate entity.

7. Defendant VirtaMove is a corporation organized and existing under the laws of Canada, with its principal place of business at 110 Didsbury Road, M083, Ottawa, Ontario K2T 0C2. *See* Ex. E (VirtaMove Corporate Profile). VirtaMove is formerly known as Appzero Software Corp. (“Appzero”), which was established in 2010. *Id.* VirtaMove also maintains an office location at 300 Brickstone Square, Suite 201, Andover, MA 01810.

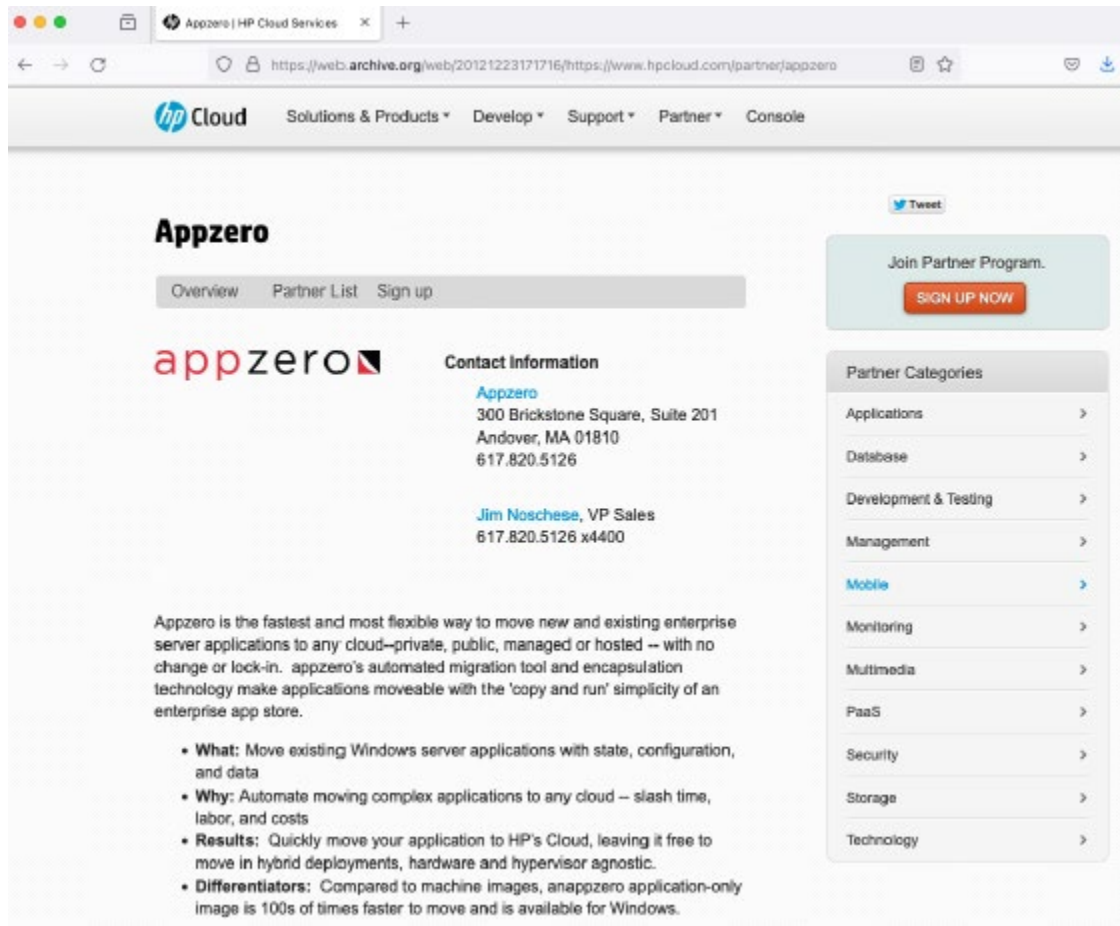
## JURISDICTIONAL STATEMENT

8. This action arises under the Declaratory Judgment Act, 28 U.S.C. § 2201, under the patent laws of the United States, 35 U.S.C. §§ 1–390.

9. This Court has subject matter jurisdiction over this action under 28 U.S.C. §§ 1331, 1338(a) and 2201(a).

10. This Court has personal jurisdiction over VirtaMove. Among other things, VirtaMove has continuous and systematic business contacts with Northern California.

11. For example, on information and belief, on November 13, 2013, AppZero, the predecessor to VirtaMove, partnered with HP Cloud Services for its products as part of its “Premier Partner Program.”



*VirtaMove, Corp. v. Hewlett Packard Enterprise Co.*, No. 2:24-cv-00093-JRG, Dkt. 40, ¶¶ 10–11 (E.D. Tex. Feb. 9, 2024); *see also* <https://icloud.pe/blog/appzero-adds-three-premier-partners-and-sees-significant-growth/>; [https://www.prweb.com/releases/appzero\\_adds\\_three\\_premier\\_partners\\_and\\_sees\\_significant\\_growth/prweb11310700.htm](https://www.prweb.com/releases/appzero_adds_three_premier_partners_and_sees_significant_growth/prweb11310700.htm).

12. This partnership took place in 2013, prior to the split of Hewlett-Packard into two separate entities, HP Inc. and Hewlett Packard Enterprise (“HPE”). Thus, at the time, this partnership was with HP Inc.

13. HP is, and was in 2013, a California company with its headquarters in Palo Alto, CA, in the Northern District of California. *See* <https://www.hp.com/us-en/hp-information/cwc/ww-briefing-center.html>. Moreover, based on information and belief, VirtaMove representatives met with HP representatives in California to discuss and demonstrate the AppZero technology that VirtaMove claims

1 is covered by the '814 and '058 patents. *VirtaMove, Corp. v. Hewlett Packard Enterprise Co.*, No. 2:24-  
 2 cv-00093-JRG, Dkt. 40, ¶¶ 10–11 (E.D. Tex. May 13, 2024).

3 14. As another example, in 2015, 2020, and 2021, AppZero met with representatives of Google  
 4 “for the purposes of partnering with VirtaMove, demonstrating AppZero, training Google on how to use  
 5 AppZero, allowing Google to run and evaluate AppZero, discussing integration of AppZero into Google  
 6 cloud, and sharing materials about how AppZero works,” and that Google allegedly “would have learned  
 7 that AppZero was patented” at that time. *See VirtaMove, Corp. v. Google LLC*, No. 7:24-cv-00033-DC-  
 8 DTG, Dkt. 27, ¶ 10 (W.D. Tex. May 21, 2024). Google is a California company with its headquarters in  
 9 Mountain View, CA, in the Northern District of California. *Id.*, ¶ 6. Based on information and belief, this  
 10 demonstration of the VirtaMove technology purportedly underlying the Asserted Patents and discussion  
 11 meetings between AppZero and Google took place in the Northern District of California.

12 15. Likewise, VirtaMove has established and maintains strategic partnerships and relationships  
 13 with companies in Northern California. For example, on April 15, 2020, VirtaMove announced a  
 14 “Strategic Partnership” with the company CloudPhysics “to Accelerate Application Modernization.” *See*  
 15 [https://virtamove.com/blog/virtamove-and-cloudphysics-co-announce-strategic-partnership-to-](https://virtamove.com/blog/virtamove-and-cloudphysics-co-announce-strategic-partnership-to-accelerate-application-modernization/)  
 16 [accelerate-application-modernization/](https://virtamove.com/blog/virtamove-and-cloudphysics-co-announce-strategic-partnership-to-accelerate-application-modernization/). That same announcement explains that CloudPhysics is  
 17 “[h]eadquartered in Santa Clara, CA,” in the Northern District of California. On information and belief,  
 18 through CloudPhysics’ use of VirtaMove’s application virtualization products as part of the strategic  
 19 partnership and offering to joint customers, CloudPhysics was granted an express or implied license to  
 20 use VirtaMove’s application virtualization patents, including the '814 and '058 patents.

21 16. VirtaMove also purposefully utilizes California servers for VirtaMove’s product V-Migrate  
 22 to use, sell, offer for sale, license, and/or distribute V-Migrate for and to California customers. For  
 23 example, VirtaMove markets V-Migrate to customers as a solution intended “to move legacy workloads  
 24 to the Cloud,” and specifically the AWS Cloud, provided by Amazon. *See*  
 25 <https://virtamove.com/blog/virtamove-partners-with-aws-launches-saas-in-aws-marketplace/>. The AWS  
 26 US West (Northern California) Region server location is in the Northern District of California. *See*  
 27 [https://aws.amazon.com/about-aws/global-infrastructure/regions\\_az/](https://aws.amazon.com/about-aws/global-infrastructure/regions_az/). On information and belief,  
 28 VirtaMove knows that these servers are located in the Northern District of California and purposefully

1 makes use of these server locations to use, sell, offer for sale, license, and/or distribute V-Migrate for and  
2 to customers in California.

3 17. On information and belief, AppZero also partnered with the company OpSource, Inc. to host  
4 VirtaMove's application virtualization products. See [https://www.varinsights.com/doc/opsources-](https://www.varinsights.com/doc/opsources-introduces-opsources-partner-0001)  
5 [introduces-opsources-partner-0001](https://www.varinsights.com/doc/opsources-introduces-opsources-partner-0001). OpSource maintains server locations in Santa Clara, CA, in the  
6 Northern District of California, used by VirtaMove as part of this partnership. See  
7 <https://www.datacenterdynamics.com/en/news/opsources-launches-santa-clara-data-center/>.

8 18. VirtaMove has additional contacts with the forum, including contacts relating to its efforts to  
9 license, enforce, and sell products allegedly embodying its patents. For example, members of  
10 VirtaMove's Board are based in Northern California, including at least Scott Munro, who is also a director  
11 of VirtaMove with fiduciary duties and obligations. See Ex. E (VirtaMove Corporate Profile). The  
12 VirtaMove representative who purportedly met with the defendants to "discuss and demo AppZero and  
13 its technology for either partnership use, distribution, and/or investment" is, on information and belief,  
14 Greg O'Connor, who at the time was the CEO of AppZero. Mr. O'Connor resides in the Northern District  
15 of California. And the attorneys and law firm VirtaMove hired to enforce its patents are located in  
16 California.

17 19. Red Hat OpenShift, the product imminently threatened with patent infringement litigation,  
18 was developed, in part, in the Northern District of California, and many of Red Hat's OpenShift customers  
19 are also based in the Northern District of California. And as explained above, VirtaMove's infringement  
20 allegations are directed primarily to the use of technologies, such as Kubernetes and Docker, that were  
21 likewise developed and that are maintained in the Northern District of California. In particular, California-  
22 based Google launched Kubernetes as an open source project based on Google's work on Borg, which  
23 was likewise developed at Google in California. Kubernetes was placed under the governance of the  
24 Cloud Native Computing Foundation ("CNCF"), which is a part of the Linux Foundation, both located in  
25 San Francisco, California. Docker containers were developed in California by Docker, Inc., which is  
26 located in San Francisco and Palo Alto, California. In addition, Red Hat implements its ContainerD and  
27 CRI-O container engines in its current version of OpenShift. CRI-O is an open source container solution  
28 specifically designed to work with Kubernetes and is maintained by the CNCF, just as Kubernetes is,

1 located in San Francisco, CA. ContainerD is an open source container runtime originally developed by  
2 Docker but today is also maintained by the CNCF. On information and belief, VirtaMove knows that  
3 these companies and technologies are based in California.

4 20. VirtaMove is also registered to do business in California and has a registered corporate agent  
5 in California. *See* Ex. F (CA Sec. of State).

6 21. Venue is proper in this District under 28 U.S.C. §§ 1391(b), (c), because a substantial part of  
7 the events giving rise to VirtaMove's claims occurred in this District, and because VirtaMove is subject  
8 to personal jurisdiction here.

### 9 **FACTUAL BACKGROUND**

#### 10 *RED HAT AND ITS OPEN SOURCE SOFTWARE*

11 22. Red Hat is a leading contributor to the open source software community. Although Red Hat  
12 makes software available under open source licenses, Red Hat derives revenue from aggregating,  
13 certifying, testing, enhancing, packaging, maintaining, supporting, and influencing the future direction of  
14 the software, among other value-added offerings. Red Hat remains committed to the open source  
15 development model, and many thousands of Red Hat's employees have contributed and continue to  
16 contribute to the open source software ecosystem, including by developing and releasing code under open  
17 source licenses. Red Hat believes that the open source development and licensing model offers important  
18 advantages for its customers over proprietary software development and licensing models.

19 23. Open source software is software in which the source code is made available to users for  
20 inspection, modification, and distribution. Generally, when a computer program is authored, the  
21 programmer writes code in a human-readable programming language called "source code." The source  
22 code can be compiled into another form, called "object code," that is executable by a computer  
23 microprocessor. With open source software, the source code itself is made available to the recipient under  
24 conditions set forth in an accompanying license, which grants relatively broad rights to recipients to use,  
25 copy, modify, and distribute the software, but may also limit the ways in which the code or derivative  
26 works of the code can be distributed so as to benefit the broader developer community.

27 24. The benefits of the open source model are widely recognized. For instance, in 2008, the  
28 Federal Circuit commented "[o]pen source licensing has become a widely used method of creative



1 collaboration that serves to advance the arts and sciences in a manner and at a pace that few could have  
2 imagined just a few decades ago.” *Jacobsen v. Katzer*, 535 F.3d 1373, 1379 (Fed. Cir. 2008).

3 25. One common open source software license is the GNU General Public License (“GPL”). The  
4 GPL permits access to human-readable software source code and provides relatively broad rights for  
5 licensees to use, copy, modify, and distribute open source software.

6 26. Red Hat is also one of the largest corporate contributors to the Linux kernel, which is a  
7 collection of programs at the heart of the Linux operating system. Through this work, Red Hat developed  
8 Red Hat Enterprise Linux (“RHEL”), which is a distribution of the Linux operating system designed for  
9 enterprise environments. One of the key features of RHEL is its subscription-based model, which provides  
10 customers with access to software updates, security patches, and technical support from Red Hat. In  
11 November 2019, Red Hat released version 8.1 of RHEL. RHEL contains numerous components which  
12 are licensed under the GPL, and other open source licenses.

13 27. For instance, Red Hat OpenShift is a family of containerization software products. One such  
14 product is the OpenShift Container Platform, which is a hybrid cloud platform built around Linux  
15 containers orchestrated and managed by Kubernetes on a foundation of Red Hat Enterprise Linux.  
16 OpenShift is an open source software product made available to third-parties through various open source  
17 licenses.

18 28. Because Red Hat provides its products as open source software programs, Red Hat maintains  
19 an open source assurance program. When a client obtains certain Red Hat open source software, they  
20 enter into the Red Hat Open Source Assurance Agreement. This agreement is designed to protect  
21 customers developing and deploying Red Hat solutions. A true and correct copy of this agreement is  
22 attached hereto as Exhibit G.

### 23 CONTAINERIZATION TECHNOLOGY

24 29. Containerization software is a technology that allows a user to package and run an application  
25 in a portable environment called a container. The container runs as an isolated process on the host  
26 operating system, which ensures that the application runs consistently regardless of the environment in  
27 which it is deployed.

1           30. The idea for dividing and separating systems and applications within a computing  
2 environment is not new. Back in the 1970s, LPARs (Logical Partitions) were developed at IBM as a  
3 virtualization technology for mainframe computers, allowing a single physical system to be divided into  
4 multiple logical servers. Each of the resulting divided systems ran its own operating system and  
5 applications. Containers, similarly, provide a means of virtualization that package cloud-native  
6 applications across different computing environments. LPARs were, and are, the foundational technology  
7 for providing isolation between applications running on the same physical or virtual system, providing the  
8 user efficiency and flexibility.

9           31. Early iterations of containerization software products include Thinstall (now known as  
10 ThinApp), FreeBSD, Virtuozzo, and Solaris, all developed in NDCA, and Zap, developed at Columbia  
11 University.

12           32. In the early 2000's, Google engineers in Mountain View, CA, developed the project Borg,  
13 which outlined the principles and design of a container orchestration system. In 2014, Google announced  
14 the launch of Kubernetes as an open source project based on Google's work on Borg. Shortly thereafter,  
15 Kubernetes was placed under the governance of the Cloud Native Computing Foundation ("CNCF"),  
16 which is a part of the Linux Foundation, both located in San Francisco, CA. Like Red Hat OpenShift,  
17 Kubernetes is an open source software program available under various open source licenses and as such,  
18 is the result of collaborative efforts of the open source community.

19           33. Around this same time, researchers and engineers at the University of California at Berkeley  
20 ("Cal") were developing another container orchestration system called Apache Mesos. Mesos also is now  
21 an open source software program available under the Apache License 2.0, a widely-used open source  
22 license, and as such, is the result of collaborative efforts of the open source community.

23           34. Around this time, Docker, Inc. developed a container orchestration platform called Swarm.  
24 The Docker software was first publicly released in Santa Clara, CA in 2013. Docker, Inc. is located in  
25 Palo Alto, CA.

26           35. To make use of a container orchestration platform like Kubernetes, Mesos, and Swarm, a  
27 software for developing and running applications in containers is required. Popular software programs  
28 include Docker, Garda, and Moby (all developed by Docker, Inc. in Palo Alto, California), ContainerD

(originally developed by Docker, Inc. but later placed under governance of the CNCF as an open source project), and Red Hat OpenShift.

36. Since their inception, Red Hat engineers contributed and continue to contribute to the open source code underlying containerization software products such as Kubernetes and Docker.

37. OpenShift was developed by Red Hat as the market began adopting containers and Kubernetes. OpenShift uses Kubernetes as its underlying container orchestration system and Red Hat Enterprise Linux as its operating system. Today, OpenShift is a leading enterprise Kubernetes platform, providing organizations with a solution for building, deploying, and managing cloud-native applications at scale across on-premises data centers, public clouds, and edge environments.

38. OpenShift version 1 was released in November 2010. Red Hat released OpenShift as an open source project in May 2012.

39. Originally, OpenShift used a custom approach to implementing Linux containers, and did so through version 2 of the product. After version 2, OpenShift shifted to use of Docker containers, along with Kubernetes as its container orchestration system. In version 4 of the product (the current version), Red Hat implemented its ContainerD, CRI-O, and Podman container engines in OpenShift.

40. CRI-O is an open source container solution specifically designed to work with Kubernetes. It was originally developed by Red Hat but today is now maintained by the CNCF, just as Kubernetes is, located in San Francisco, CA.

41. Podman is likewise an open source container management tool that was developed by Red Hat.

42. ContainerD is an open source container runtime originally developed by Docker but today is now maintained by the CNCF. ContainerD is widely used for container orchestration platforms like Kubernetes.

43. IBM offers a service to third-party enterprises to manage containerization of their applications called IBM Cloud Kubernetes Service (“IBM Kubernetes”). Initially, IBM partnered with Docker, Inc. to bring containerization technologies to enterprise clients and integrated Docker into its platform. After Docker moved to a more proprietary route, IBM began using Kubernetes and other container platforms such as through the Open-Container Initiative (“OCI”).

1 44. IBM Kubernetes is a service for businesses to manage their containerization, utilizing  
 2 software developed by third parties such as Kubernetes (developed by CNCF), Docker (developed by  
 3 Docker, Inc.), and other open source container projects.

4 *RELEVANT RELATED LITIGATION*

5 45. On January 31, 2024, VirtaMove sued IBM in the Eastern District of Texas alleging  
 6 infringement of the Asserted Patents. See *VirtaMove, Corp. v. Int’l Bus. Machines Corp.*, No. 2:24-cv-  
 7 00064-JRG (W.D. Tex. Jan. 31, 2024); Ex. I.

8 46. The ’814 patent is titled “System for Containerization of Application Sets.” The ’814 patent  
 9 is based on application No. 10/939,903 filed on September 13, 2004 and supposedly claims priority to  
 10 provisional application No. 60/502,619, filed on September 15, 2003. A true and correct copy of the ’814  
 11 patent is attached hereto as Exhibit J.

12 47. The ’058 patent is titled “Computing System Having User Mode Critical System Elements as  
 13 Shared Libraries.” The ’058 patent is based on application No. 10/946,536 filed September 21, 2004 and  
 14 supposedly claims priority to provisional application No. 60/504,213, filed on September 22, 2003. A  
 15 true and correct copy of the ’058 patent is attached hereto as Exhibit K.

16 48. The named inventors for both Asserted Patents are Donn Rochette, Paul O’Leary, and Dean  
 17 Huffman. On information and belief, Mr. Rochette currently resides in Ohio and Mr. O’Leary and Mr.  
 18 Huffman in Ottawa, Canada. The Asserted Patents are assigned to Trigence Corp., an Ottawa, Canada  
 19 corporation. On information and belief, Trigence was later acquired by or merged with Appzero, which  
 20 later became VirtaMove.

21 49. In its May 29, 2024 Second Amended Complaint against IBM, VirtaMove alleged IBM’s  
 22 Kubernetes infringed the Asserted Patents, focusing exclusively on functionality provided by third-party  
 23 software Kubernetes and Docker. A true and correct copy of those infringement contentions is attached  
 24 hereto as Ex. A at Exhibits 2 and 4.

25 50. Around the same time VirtaMove sued IBM, VirtaMove also sued Amazon, Google, and HPE  
 26 alleging infringement of the same Asserted Patents. On January 26, 2024, VirtaMove sued Amazon in  
 27 WDTX alleging infringement by Amazon’s AWS End-of-Support Migration Program (“EMP”) and  
 28 Elastic Container Service (“ECS”). *VirtaMove, Corp. v. Amazon.com, Inc.*, No. 7:24-cv-00030, Dkt. 1

(W.D. Tex. Jan. 26, 2024) (“*Amazon Case*”). On January 31, 2024, VirtaMove sued Google in WDTX alleging infringement by Google’s Migrate to Containers service. *VirtaMove, Corp. v. Google LLC*, No. 7:24-cv-00033, Dkt. 1 (W.D. Tex. Jan. 31, 2024) (“*Google Case*”). And on February 9, 2024, VirtaMove sued HPE in EDTX alleging infringement by HPE’s Ezmeral Runtime Enterprise. *VirtaMove, Corp. v. Hewlett Packard Enterprise Co.*, No. 2:24-cv-00093-JRG, Dkt. 1 (E.D. Tex. Feb. 9, 2024) (“*HPE Case*”). All of VirtaMove’s infringement allegations in these matters are based on the use of Kubernetes and Docker containers.

51. At a high-level, and based on Red Hat’s understanding of VirtaMove’s contentions without conceding the scope or functionality of the Asserted Patents, VirtaMove’s infringement allegations are directed at two features: (1) Containerizing applications and their dependencies; and (2) Deploying the resulting containers across a network infrastructure. Red Hat OpenShift uses the same open source components accused of infringement in IBM, HPE, Amazon, and Google’s products—Docker containers (or containers generally) and Kubernetes. VirtaMove is aware of this. Indeed, in a June 8, 2020 blog post on VirtaMove’s own website, VirtaMove explains that OpenShift is “an evolution of the Kubernetes Enterprise 1.17 platform. OpenShift Container Platform is a cloud development Platform as a Service (PaaS) built around Docker containers. The platform is orchestrated and managed by Kubernetes on a foundation of Red Hat Enterprise Linux. It offers a cloud foundation for building, deploying, and scaling new containerized applications.”

## Red Hat OpenShift 4.4 Opens a World of Possibility

In Spring 2020, Red Hat released OpenShift 4.4., an evolution of the Kubernetes Enterprise 1.17 platform. **OpenShift Container Platform** is a cloud development Platform as a Service (PaaS) built around Docker containers. The platform is orchestrated and managed by **Kubernetes** on a foundation of Red Hat Enterprise Linux. It offers a cloud foundation for building, deploying, and scaling new containerized applications. It’s particularly attractive for IT shops interested in developing cloud-enabled micro services.

Red Hat believes that companies need faster and more widespread access to essential apps and services. IT departments are pressured to become ever more agile to deliver innovative solutions. **According to Red Hat**, this landscape translates to “container and Kubernetes-powered open hybrid cloud”. A **preferred path** in the enterprise cloud adoption journey is “application platforms supporting an architecture that gives developers a wide choice of components across hybrid cloud infrastructure.”

At VirtaMove, we’re also intrigued by new applications such as OpenShift, believing that we can use them to containerize legacy applications and retro fit them for load balancing and service architectures.

Containerization boasts many benefits, chiefly among these accelerating the development and deployment of apps on cloud infrastructure. Both Kubernetes and OpenShift promise easy container management.

See <https://virtamove.com/blog/shift-to-the-future-now/>.

52. Furthermore, VirtaMove has previously recognized that Red Hat OpenShift “is built around Docker containers” and “offers a cloud foundation for building, deploying, and scaling new containerized applications.” <https://virtamove.com/blog/shift-to-the-future-now/>. Indeed, “building, deploying, and scaling new containerized applications” is not unique to Red Hat OpenShift, but rather a central feature in each of the products VirtaMove has accused of infringing.

53. VirtaMove’s infringement contentions against IBM, HPE, Google, and Amazon could have just as easily been levied against Red Hat OpenShift without altering any of their substance.

54. For example, VirtaMove’s infringement contentions against all four of the Defendants identify the use of Docker containers—specifically, the use of Dockerfiles and Docker images to create Docker containers—as infringing the Asserted Patents. Red Hat’s OpenShift likewise offers Docker containers by building container images from Dockerfiles to create Docker images.

### Building a simple container

You have an idea for an application and you want to containerize it.

First you require a tool for building a container, like buildah or docker, and a file that describes what goes in your container, which is typically a Dockerfile.

Next, you require a location to push the resulting container image so you can pull it to run anywhere you want it to run. This location is a container registry.

Some examples of each of these components are installed by default on most Linux operating systems, except for the Dockerfile, which you provide yourself.

The following diagram displays the process of building and pushing an image:

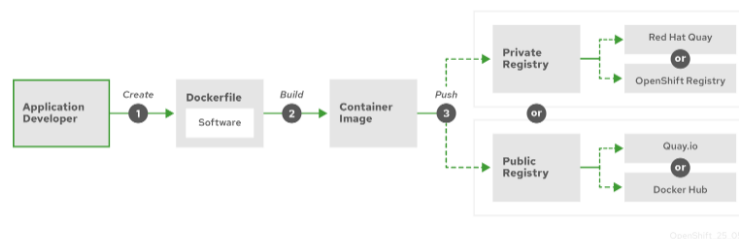


Figure 1. Create a simple containerized application and push it to a registry

<https://docs.openshift.com/container-platform/4.15/architecture/understanding-development.html>

55. As another example, for the limitation of the ’814 patent requiring “storing in memory accessible to at least some of the servers a plurality of secure containers of application software, each container comprising one or more of the executable applications and a set of associated system files required to execute the one or more applications, for use with a local kernel residing permanently on one

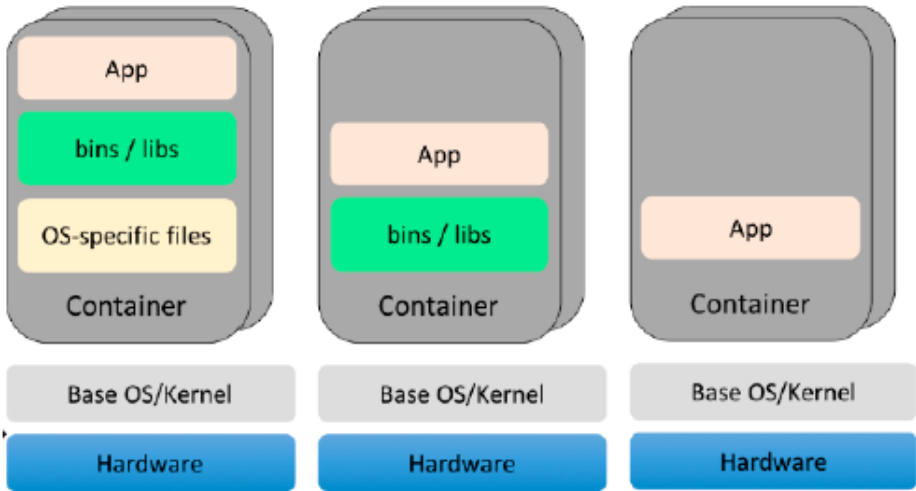
the servers,” based on Red Hat’s understanding of VirtaMove’s contentions, without conceding the scope or functionality of the Asserted Patents, VirtaMove relies on IBM’s use of application containers, which are based on Docker images created from Dockerfiles, in a Kubernetes environment. *See, e.g.,* Ex. L (VirtaMove’s ’814 IBM Infringement Chart) at 9-22 (“For example, IBM Cloud Kubernetes stores **application containers, sometimes called Docker containers, container images, Kubernetes containers, or Kubernetes pods, in persistent storage available to each node running the application.** The container might be in a format defined by the Open Container Initiative. This storage may be physically attached to the server or connected through any supported interconnect, including over a network. Each container includes the application software as well as a Linux user space required to execute the application, for example libc/glibc and other shared libraries, configuration files, etc. necessary for the application. For example, the container includes a base OS image, provided by IBM or by a third party, such as a CentOS, RHEL, or Ubuntu base image. The container is compatible with the host kernel, for example because the container libraries are linked against the Linux kernel, and the supported host operating systems also use the Linux kernel, which has a stable binary interface.”) (emphasis added); Ex. C at Exhibit 2 (Google ’814 Infringement Chart) at 5-7 (identifying the use of containers); Ex. B at Exhibit 2 (HPE ’814 Infringement Chart) at 4-8 (identifying the use of Docker containers in a Kubernetes environment). While Red Hat disputes that these features (and all of its features) infringe VirtaMove’s patents, all of the IBM features accused by VirtaMove are likewise offered in/supported by Red Hat OpenShift. With respect to Amazon, VirtaMove identifies “packaging of the application and its dependencies” and “migration [of that package] to [a new] environment.” *See* Ex. D at Exhibit 2 (Amazon ’814 Infringement Chart) at 4-6. Again, these identified Amazon features are also offered in/supported by Red Hat OpenShift. And just as that “package” is migrated to a new environment, containers in Red Hat OpenShift can be migrated to new environments. [https://docs.redhat.com/en/documentation/openshift\\_container\\_platform/4.15/html-single/migration\\_toolkit\\_for\\_containers/index#about-mtc](https://docs.redhat.com/en/documentation/openshift_container_platform/4.15/html-single/migration_toolkit_for_containers/index#about-mtc).

56. As another example, for the limitation of the ’814 patent requiring “containers of application software excluding a kernel,” based on Red Hat’s understanding of VirtaMove’s contentions, without conceding the scope or functionality of the Asserted Patents, VirtaMove relies on the Texas Cases Accused Products’ use of containerization technology. *See, e.g.,* Ex. L (VirtaMove’s ’814 IBM Infringement



Chart) at 22-24 (identifying the use of containers); Ex. C at Exhibit 2 (Google '814 Infringement Chart) at 9-10 (identifying the use of containers in a Kubernetes environment); Ex. B at Exhibit 2 (HPE '814 Infringement Chart) at 9-10 (identifying the use of Docker containers); Ex. D at Exhibit 2 (Amazon '814 Infringement Chart) at 4-6 (identifying “packaging of the application and its dependencies” and “migration [of that package] to [a new] environment,” which describe the function of containers and Kubernetes).

Claim 1	Accused Instrumentalities
	<p>Containers are often referred to as “lightweight,” meaning they share the machine’s operating system kernel and do not require the overhead of associating an operating system within each application. Containers are inherently smaller in capacity than a VM and require less start-up time, allowing far more containers to run on the same compute capacity as a single VM. This drives higher server efficiencies and, in turn, reduces server and licensing costs.</p> <p>Containers encapsulate an application as a single executable package of software that bundles application code together with all of the related configuration files, libraries, and dependencies required for it to run. Containerized applications are “isolated” in that they do not bundle in a copy of the operating system. Instead, an open source runtime engine (such as the Docker runtime engine) is installed on the host’s operating system and becomes the conduit for containers to share an operating system with other containers on the same computing system.</p> <p><a href="https://www.ibm.com/topics/containerization">https://www.ibm.com/topics/containerization</a></p>

Claim 1	Accused Instrumentalities		
	<p><b>Container</b></p>  <p>Containers share the same base Kernel</p> <p><a href="https://ibm.github.io/kube101/">https://ibm.github.io/kube101/</a></p>		



1 Ex. L (VirtaMove’s ’814 IBM Infringement Chart) at 26-27 (identifying the use of containers). Red Hat  
 2 OpenShift uses the same containerization technology that VirtaMove accuses of infringement. *See, e.g.,*  
 3 [https://docs.openshift.com/container-platform/4.15/openshift\\_images/index.html](https://docs.openshift.com/container-platform/4.15/openshift_images/index.html) (“The basic units of  
 4 OpenShift Container Platform applications are called containers.”).

5 57. As yet another example, in the limitation of the ’814 patent requiring “wherein each of the  
 6 containers has a root file system that is different from an operating system’s root file system[,]” based on  
 7 Red Hat’s understanding of VirtaMove’s contentions, without conceding the scope or functionality of the  
 8 Asserted Patents, VirtaMove relies on the Texas Cases Accused Products’ use of Dockerfiles to build  
 9 Docker images comprising an application and its dependencies, which can then run in a Kubernetes  
 10 environment as a container, as well as IBM’s use of Open Container Initiative (“OCI”) images. *See, e.g.,*  
 11 Ex. L (VirtaMove’s ’814 IBM Infringement Chart) at 36-46; Ex. C at Exhibit 2 (Google ’814 Infringement  
 12 Chart) at 14-15 (identifying the use of Docker containers and Kubernetes); Ex. B at Exhibit 2 (HPE ’814  
 13 Infringement Chart) at 12 (identifying the use of Docker containers); Ex. D at Exhibit 2 (Amazon ’814  
 14 Infringement Chart) at 4-6 (identifying “packaging of the application and its dependencies” and  
 15 “migration [of that package] to [a new] environment,” which describe the function of containers and  
 16 Kubernetes), 11 (“The package contains both the file and registry data of the packaged application, and  
 17 the EMP binaries and configuration files that are required to deploy and run the packaged application.”).  
 18 The IBM features accused by VirtaMove are features offered in and supported by Red Hat OpenShift. *See,*  
 19 *e.g.,* Ex. H [https://docs.openshift.com/container-platform/4.15/openshift\\_images/index.html](https://docs.openshift.com/container-platform/4.15/openshift_images/index.html) (“Containers  
 20 in OpenShift Container Platform are based on OCI- or Docker-formatted container images . . . You can  
 21 use . . . [D]ocker CLI directly to build images.”); [https://docs.openshift.com/container-](https://docs.openshift.com/container-platform/4.15/architecture/understanding-development.html)  
 22 [platform/4.15/architecture/understanding-development.html](https://docs.openshift.com/container-platform/4.15/architecture/understanding-development.html) (describing the process of building a  
 23 container, which includes the steps of creating a Dockerfile and building a container image using Docker  
 24 commands).

25 58. As another example, for the limitation of the ’058 patent requiring “a shared library having  
 26 shared library critical system elements (SLCSEs) stored therein for use by the plurality of software  
 27 applications in user mode[,]” based on Red Hat’s understanding of VirtaMove’s contentions, without  
 28 conceding the scope or functionality of the Asserted Patents, VirtaMove relies on the Texas Cases Accused

Products’ use of Dockerfiles to build Docker images comprising an application and its dependencies, which can later be deployed in a Kubernetes environment as containers, as well as IBM’s use of OCI images. *See, e.g.*, Ex. L (VirtaMove’s ’058 IBM Infringement Chart) at 5-18; Ex. C at Exhibit 4 (Google ’058 Infringement Chart) at 7-12 (“For example, Migrate to Containers automatically generates a **container image**, a **Dockerfile** . . . **Kubernetes deployment** . . .”); Ex. B at Exhibit 4 (HPE ’058 Infringement Chart) at 5-7 (“These containers are based on **Docker** . . . The idea of containerization is to isolate and **package the application with all the dependencies in a container.**”); Ex. D at Exhibit 4 (Amazon ’058 Infringement Chart) at 3-4 (“Amazon ECS uses Docker images.”). Even more so than the ’814 patent, VirtaMove’s ’058 infringement contentions universally – for all Texas Cases Accused Products – identify the use of Dockerfiles, Docker images, and Docker containers. Indeed, VirtaMove’s accusations further suggest that packaging an application with its dependencies is all that is required to infringe the limitations of the ’058 patent. Based on Red Hat’s understanding of VirtaMove’s contentions, without conceding the scope or functionality of the Asserted Patents, Red Hat OpenShift uses the same open source technology that VirtaMove accuses of infringement.

59. Despite not naming Red Hat’s OpenShift as an accused product in any of the above cases, VirtaMove’s infringement allegations—focused on the use and deployment of Kubernetes, Docker, and other open source software programs—against the same containerization and container orchestration technologies used in OpenShift create a justiciable controversy between Red Hat and VirtaMove. Indeed, VirtaMove has initiated litigation against IBM, HPE, Amazon, and Google alleging that the same containerization and container orchestration technology—*e.g.*, use of containers and Kubernetes to build, manage, and deploy containerized applications in network infrastructures—infringes two VirtaMove patents. Red Hat OpenShift allows for building container base images comprising an application and its dependencies from Dockerfiles, deploying those images into servers to run as containers, and using Kubernetes as a container orchestration platform. Based on the accusations against the existing Defendants, which are directed at technology used in Red Hat’s OpenShift, it is not a matter of “if” VirtaMove will bring an action against Red Hat accusing OpenShift of infringement, but “when.”

*RED HAT DOES NOT INFRINGE THE ASSERTED PATENTS*

60. Red Hat OpenShift does not directly or indirectly infringe any claim of the Asserted Patents. To the best of Red Hat's knowledge, no third party infringes any claim of the Asserted Patents by using Red Hat OpenShift. Red Hat has not caused, directed, requested, or facilitated any such infringement, must less with the specific intent to do so. Red Hat OpenShift is not designed for use in any combination which infringes any claim of the Asserted Patents. To the contrary, it is a product with substantial uses that do not infringe any claim of the Asserted Patents.

61. Among other reasons, Red Hat OpenShift does not infringe the '814 patent because each of the containers in the product do not have a "unique root file system that is different from an operating system's root file system," as required by the claims of the '814 patent. Moreover, Red Hat OpenShift does not infringe the '814 patent because it does not practice "each container being mutually exclusive of the other, such that read/write files within a container cannot be shared with other containers," as required by the remaining claims of the '814 patent.

62. Among other reasons, Red Hat OpenShift does not infringe the '058 patent because the product does not "store in the shared library . . . functional replicas of OSCSEs," as required by all claims of the '058 patent. Rather, at build time, the program pulls a container base image from the container registry, upon which application code and application dependencies can be built. More specifically, application code and application dependencies are installed into the container base image. Applications are not accessing a shared library for application dependencies and becoming distinct operating system environments thereafter.

**FIRST COUNT**  
**(Declaration of Non-Infringement of U.S. Patent No. 7,519,814)**

63. Red Hat restates and incorporates by reference all allegations in this Complaint as if fully set forth herein.

64. VirtaMove claims to own all rights, title, and interest, including the right to seek damages for past, present, and future infringement thereof, in the '814 patent. A true and correct copy of the '814 patent is attached hereto as Exhibit J.

65. In the case VirtaMove has brought against IBM, VirtaMove accuses IBM of infringing the '814 patent based on allegations that focus solely on functionality provided by Kubernetes, Docker, and other open source software—functionalities integrated into Red Hat OpenShift.

66. A substantial, immediate, and real controversy exists between Red Hat and VirtaMove regarding whether Red Hat OpenShift infringes or has infringed the '814 patent. A judicial declaration is necessary to determine the parties' respective rights regarding the '814 patent.

67. Red Hat seeks a judgment declaring that Red Hat OpenShift does not directly or indirectly infringe any claim of the '814 patent. In its complaint, and infringement contentions, against IBM, VirtaMove cites to IBM Kubernetes as purported evidence of infringement of claims 1, 2, 6, 9, and 10 of the '814 patent. Based on Red Hat's present understanding of claims 1, 2, 6, 9, and 10 of the '814 patent and VirtaMove's allegations, Red Hat OpenShift fails to meet or embody the limitations of claims 1, 2, 6, 9, and 10 of the '814 patent.

**SECOND COUNT**  
**(Declaration of Non-Infringement of U.S. Patent No. 7,784,058)**

68. Red Hat restates and incorporates by reference all allegations in this Complaint as if fully set forth herein.

69. VirtaMove claims to own all rights, title, and interest, including the right to seek damages for past, present, and future infringement thereof, in the '058 patent. A true and correct copy of the '058 patent is attached hereto as Exhibit K.

70. In the case VirtaMove has brought against IBM, VirtaMove accuses IBM of infringing the '058 patent based on allegations that focus solely on functionality provided by Kubernetes, Docker, and other open source software—functionalities integrated into Red Hat OpenShift.

71. A substantial, immediate, and real controversy exists between Red Hat and VirtaMove regarding whether Red Hat OpenShift infringes or has infringed the '058 patent. A judicial declaration is necessary to determine the parties' respective rights regarding the '058 patent.

72. Red Hat seeks a judgment declaring that Red Hat OpenShift does not directly or indirectly infringe any claim of the '058 patent. In its complaint, and infringement contentions, against IBM, VirtaMove cites to IBM Kubernetes as purported evidence of infringement of claims 1, 2, 3, 4, and 18 of the '058 patent. Based on Red Hat's present understanding of claims 1, 2, 3, 4, and 18 of the '058 patent

1 and VirtaMove's allegations, Red Hat OpenShift fails to meet or embody the limitations of claims 1, 2, 3,  
2 4, and 18 of the '058 patent.

3 **PRAYER FOR RELIEF**

4 WHEREFORE, Red Hat prays for judgment and relief as follows:

5 A. Declaring that Red Hat's products, including OpenShift, do not infringe directly or indirectly  
6 any claim of the '814 patent and enjoining VirtaMove, its officers, agents, employees, attorneys, and all  
7 persons in active concert or participation with them, from directly or indirectly charging infringement, or  
8 instituting further action for infringement, of the '814 patent against Red Hat or any of its customers;

9 B. Declaring that Red Hat's products, including OpenShift, do not infringe directly or indirectly  
10 any claim of the '058 patent and enjoining VirtaMove, its officers, agents, employees, attorneys, and all  
11 persons in active concert or participation with them, from directly or indirectly charging infringement, or  
12 instituting further action for infringement, of the '058 patent against Red Hat or any of its customers;

13 C. Finding that this is an exceptional case under 35 U.S.C. § 285;

14 D. Awarding Red Hat its costs and attorneys' fees in connection with this action; and

15 E. Such further and additional relief as the Court deems just and proper.

16 **JURY DEMAND**

17 Red Hat demands a jury trial on all issues and claims so triable.  
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